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DISPLAYING THREE-DIMENSIONAL DATA(U) ALABAMA UNIV IN
BIRMINGHAM DEPT OF MATHEMATICS L KORBLY ET AL 1987
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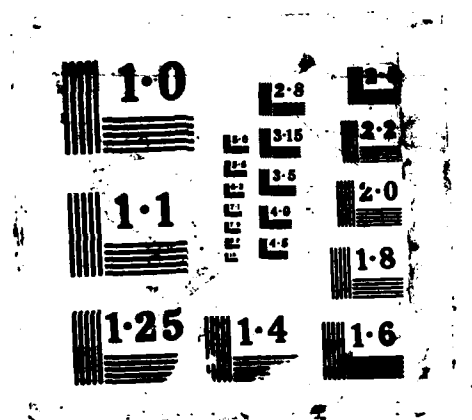
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<p>The objective of the project was to graphically represent data obtained in the course of solving equations of fluid dynamics. Studies of three-dimensional data were done with data arising from a fluid dynamics problem involving high temperatures and velocities. Three representational methods were used: 1) particle tracings showing vectors pointing in the direction of flow at a point, 2) representation of contours, and 3) ray tracing, with color values assigned to a cell depending on the values of some quantity such as density.</p>			
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FINAL SCIENTIFIC REPORT
 "Displaying Three-Dimensional Data"
 (Letitia Korbly, P.I. - Grant AFOSR-83-0247)
 Prepared by Peter V. O'Neil

The objective of the project was to graphically represent data obtained in the course of solving equations of fluid dynamics.

In presenting two-dimensional scalar data, it has been found that color and carpet plots are the most effective. Combined color-carpet plots can be even more effective. On the other hand, contour plots tend to be difficult to interpret.

Studies of three-dimensional data were done with data arising from a fluid dynamics problem involving high temperatures and velocities. The data was tested on the RAVEN program, with data from Apache. Basically, three methods were used:

1. Particle tracing consists of showing vectors pointing in the direction of the flow at a point. The length of each arrow represents the magnitude of the velocity vector. One difficulty with this method is that, if the plane is orthogonal to or transverse to the direction of flow, information is lost in components of vectors normal to the plane.
2. A second method is representation of contours. A new method employs contours shown by carpet plots of implicitly defined functions.
3. A final method consists of ray tracing, in which the volume is partitioned into the small cells generated by the method of solution. Color values can be assigned to cells depending on values of some quantity such as density.

In all of these methods, both scaling and perspective are particularly important. Perspective should be periodically changed to detect movement from different directions. In addition, the display scheme must be integrated with the numerical solution in order to reduce computer time and storage. Both programming practices and suitable hardware must be carefully chosen together to implement the schemes.



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